(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 592 054 A1**

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **93202865.7**

(51) Int. Cl.[5]: **H01B 5/00**

(22) Date of filing: **08.10.93**

(30) Priority: **09.10.92 NL 9201755**

(43) Date of publication of application:
13.04.94 Bulletin 94/15

(84) Designated Contracting States:
BE DE FR GB NL

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(54) **Electric fence construction.**

(57) An electric fence wire construction having a supporting structure and a plurality of filaments (6) of electric current-conducting material. At least one group of the filaments (6) of conducting material is intertwined into a strand (5). Forces exterted on the filaments (6) of conducting material are distributed more evenly over said filaments and the conducting filaments cut less into the supporting structure. Further, the conducting filaments (6) may be relatively thin, thus reducing the susceptibility to fatigue due to repeated bending and further promoting the working life.

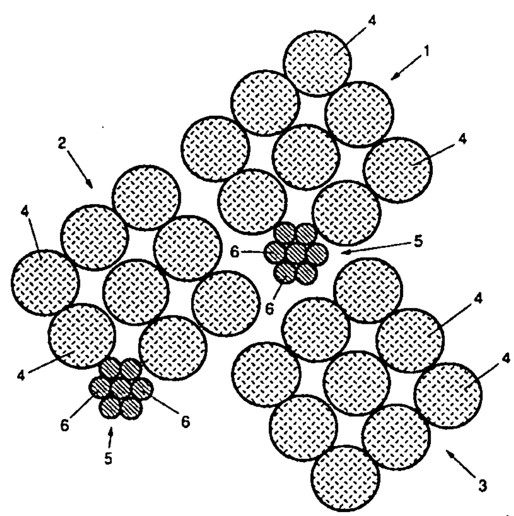

FIG. 1

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The invention relates to an electric fence wire construction according to the preamble of claim 1.

An electric fence wire construction of this type is disclosed in U.S. Patent 3,291,897. This known electric fence wire construction is a twined construction.

For the conducting material, metal, in particular typically tinned copper or stainless galvanized steel, is proposed. Steel offers the advantage of having great mechanical strength. On the other hand, this material offers quite some resistance to electric current. Copper conducts electric current much (ca. 57 times in alloys suitable for use in electric fence wire) better than steel, but has inferior mechanical properties. Basically, the same applies in fact to aluminum.

In particular when the mechanically weaker conductor materials are used, the problem of fracture of the conductors occurs. This is caused in particular by fatigue (for instance by swinging of the electric fence wire in the wind, frequently knotting or winding and unwinding) and by local tensile load of the conductor at knots and other fastenings. An additional problem is that in the case of fracture of the conductor it is difficult to locate where it is broken, because the supporting structure holds the portions of the conductor closely together on both sides of the fracture.

In the more than twenty-five years since the electric fence wire construction of this type has been known, various attempts were made to increase the working life and reliability of the electric conduction.

In European patent application 0 104 669, it is proposed that the problem of fracture of the conductors be solved by manufacturing the supporting structure from low-elasticity material, such as glass fiber material.

However, the use of a low-elasticity supporting material seems to contribute little to limiting the load of the conductors during bending of the electric fence wire. Further, low-stretch materials are relatively expensive, low-stretch wire is more difficult to apply tautly than relatively elastic wire, they have a relatively slight impact resistance, and the low-stretch filaments of the supporting structure for supporting the conductors offer most support to the conductors if the conductors are always disposed directly next to filaments of the supporting structure, embedded in that supporting structure and hence do not project from the supporting structure. However, in order to promote the current conduction to animals touching the electric fence wire, it is desired that the conductors project from the supporting structure. Moreover, glass fibre material is not sufficiently resistant to bending loads and the breaking strength thereof is so great that in the event of calamities there is a substantial chance of injuries by cutting of the electric fence wire.

In European patent application 0 256 841, it is proposed that in one electric fence wire construction conductors of different materials be used, such as stainless steel and copper. The first conductor material has a greater tensile strength than the second conductor material and the second conductor material conducts electricity better than the first conductor material. However, this involves the drawback that in the electric fence wire construction a conductor is present which hardly contributes to the conduction of electric current. A further drawback of this construction is that the fact that different metals are in contact with each other may cause electrolytic corrosion. Experiments conducted by applicant have shown that under unfavorable conditions (moist climate, air pollution, acid rain) a degree of electrolytic corrosion which is relevant to the working life still occurs. In this connection, it is particularly inconvenient that especially in heavily loaded locations such as in knots and at points of attachment, moisture evaporates relatively slowly, so that especially at those locations, corrosion causes accelerated weakening of the conductor.

The object of the invention is to provide an electric fence wire having an increased durability and in which the drawbacks of the electric fence wire constructions described hereinabove are not inherent.

According to the invention, this object is attained by applying the characterizing features according to claim 1 to an electric fence wire construction of the type described in the preamble.

In an electric fence wire construction according to the invention, the intertwined conductor filaments of a strand are held together more properly and the forces exerted on the conductors are distributed over the filaments thereof more properly, so that the maximum mechanical load of individual filaments is limited. In particular the maximum tensile and upsetting forces exerted on individual filaments during bending of the electric fence wire are limited considerably. A further advantage of the intertwining of the conductor filaments is that these filaments cut less into the supporting structure than when the filaments of the conducting material are provided in the electric fence wire construction in a conventional manner.

Moreover, because of the two above-mentioned effects, the conducting filaments may be relatively thin. In a given bending, the stretching and upsetting of the filaments will be less according as they are thinner. Hence, thinner filaments are less susceptible to fatigue due to repeated bending loads. Thus, a further increase of the working life and the reliability of the electric fence wire can be realized.

Hereinafter, the invention will be explained in more detail on the basis of two exemplary embodiments, with reference to the accompanying drawings. In these drawings:

Fig. 1 schematically shows a sectional view of a first exemplary embodiment of an electric fence wire construction according to the invention,

Fig. 2 shows a side view of the electric fence wire construction according to Fig. 1, and

Fig. 3 shows a top plan view of a second exemplary embodiment of an electric fence wire construction according to the invention.

The invention will first be explained in more detail with reference to the exemplary embodiment shown in Figs 1 and 2.

The electric fence wire construction shown in these figures comprises a conventional supporting structure consisting of three strands 1, 2, 3, each comprising intertwined filaments 4 of synthetic material, for instance polyethylene. For the sake of convenience, only some of these synthetic filaments 4 are designated by a reference numeral.

Two of the three strands 1, 2, 3, which two strands are designated by the reference numerals 1 and 2, each comprise a group of filaments 6 of electric current-conducting material. For the sake of convenience, again, only some of the conducting filaments 6 are designated by a reference numeral.

The conducting filaments 6 of each group are intertwined into a strand 5. As a result, they are held together more properly and the forces exerted on the conductors are distributed more properly over the conducting filaments 6 than in known electric fence wire constructions. Thus, the maximum mechanical loads of individual filaments 6 are limited. In this manner, in particular the maximum tensile force exerted on individual filaments 6 during bending of the electric fence wire is limited considerably. A further advantage of the intertwining of the conductor filaments 6 is that they cut less into the supporting structure than when the conducting filaments 6 are provided in the electric fence wire construction in a conventional manner.

Moreover, because of the lower maximum mechanical load and the slighter cutting action thereof, the conducting filaments 6 may be relatively thin. At a given bending of the electric fence wire, thinner filaments are deformed less and are hence less susceptible to fatigue due to repeated bending loads. In this manner, a further increase of the working life and the reliability of the electric fence wire can be realized.

Preferably, the filaments 6 of conducting material have a diameter smaller than or equal to 0.25 mm. In the known electric fence wire constructions, the use of filaments having such a small diameter has the drawback that the tensile strength of the individual conducting filaments is too slight. In an electric fence wire construction according to the present invention, the most favorable thickness of the filaments is obtained at a diameter of at least 0.10 mm and at most 0.16 mm.

The electric fence wire construction according to the exemplary embodiment shown in Figs 1 and 2 is provided with seven conducting filaments 6 per conducting strand 5.

Preferably, the conducting strand 5 comprises at least four filaments 6 of conducting material. Most preferable is an electric fence wire construction wherein the strand consisting of filaments of conducting material comprises at least seven and at most eighteen filaments of conducting material. In the case of such a number of conducting filaments 6 per conducting strand 5, the most favorable combination is obtained between on the one hand flexibility of the conducting filaments and on the other hand strength of the individual filaments and cost price of the electric fence wire construction.

It is observed that optionally, together with the conducting filaments, one or more non-conducting filaments may also be twined along in one or more of the conducting strands, for instance as mark wire in order to increase visibility of the intertwining of the conducting filaments, so that the difference between the electric fence wire construction according to the invention and the existing electric fence wire constructions are made more clearly visible.

Analogously with the filaments 4 of the supporting structure, the conductor filaments 6, twined into a strand 5, are twined along in the first two strands 1 and 2. As a result, the conductor is incorporated into the electric fence wire construction in an efficient and evenly distributed manner. It is observed that, obviously, it is also possible to incorporate a twined conducting strand into each strand or into one of the strands only.

The exemplary embodiment of the electric fence wire construction according to claim 1 shown in Fig. 3 is designed as a woven electric fence ribbon having a fabric-shaped strip 7, with the strands 5, consisting of conducting filaments, forming warps of that fabric-shaped strip 7. In this manner, the conductor can be incorporated into an electric fence ribbon in an efficient and evenly distributed manner.

The electric fence ribbon according to Fig. 3 has an outward appearance with twined ropes 8 along the lateral edges thereof. An electric fence ribbon with such an appearance is known from international model deposit No. DM/019243.

In an electric fence ribbon with such an outward appearance, the contact between the conductor material and an animal touching the ribbon can be promoted by incorporating strands 5, twined

from conductor material, into the twined ropes 8. As a result, conducting material is present along the lateral edges, which increases the chance of sufficiently intensive contact of the conductor material with the animal.

Preferably, an electric fence wire construction according to the invention, of whatever design, incorporates such an oversize in longitudinal direction of the strand 5 or strands 5 consisting of filaments 6 of conducting material, that portions thereof project from the supporting structure. In practice, a difference in length up to ca. 10% between the filaments of the supporting structure and of the conducting strand or strands proves to be very satisfactory. Also because of the greater length of the conducting strands, the contact between conductor material and an animal touching the electric fence wire construction is promoted. In particular in an electric fence wire construction wherein the conducting filaments are disposed loosely, rather than tautly, in the supporting structure, the load of the conductor filaments is considerably different from the load of the supporting structure and hence it is particularly favorable when the conducting filaments 6 are intertwined, so that they support each other and an even distribution of loads over the conducting filaments is promoted.

Because in the electric fence wire construction according to the invention, the conducting filaments are loaded relatively lowly, it is advantageous to manufacture them from copper, aluminum or at least alloys thereof, which metals readily conduct electric current, but which are mechanically relatively weak. Further, for all conducting filaments of the electric fence wire construction the same material can be used. This offers the advantage of preventing electrolytical corrosion due to potential difference between different metals.

Hereinafter, two other embodiments of the invention are described, preferred most at present. These embodiments are provided with conducting strands, each having seven filaments of tinned copper with a diameter of 0.16 mm each, respectively eighteen filaments of tinned copper with a diameter of 0.10 mm each. The thickness of the strand of conducting filaments is always ca. 0.5 mm. The constructions are each provided with two conducting strands, each being twined along in a separate strand of the supporting structure. The supporting structure always consists of three strands, each having three to eight synthetic filaments having a thickness of 400-1,600 denier, i.e., a diameter of a fourth to half a millimeter, while the strand that does not comprise a conducting strand has one synthetic filament more than the two strands that do comprise a conducting strand. The conducting strands are always twined with ca. 90 lays per meter in an opposite direction of the twining direction of the strands of the supporting structure wherein they are twined along.

Claims

1. An electric fence wire construction comprising a supporting structure and a plurality of filaments (6) of electric current-conducting material, characterized in that at least one group of the filaments (6) of conducting material is intertwined into a strand (5) substantially consisting of filaments (6) of conducting material.

2. An electric fence wire construction according to claim 1, characterized in that the electric fence wire comprises a plurality of intertwined strands (1, 2, 3), each comprising intertwined filaments (4), while a strand (5) substantially consisting of filaments (6) of conducting material is twined along in at least one of the strands (1, 2, 3).

3. An electric fence wire construction according to claim 1, characterized in that the electric fence wire is designed as ribbon having a fabric-shaped strip (7) and the strand (5) substantially consisting of filaments (6) forms a warp of said fabric-shaped strip (7).

4. An electric fence wire construction according to any one of the preceding claims, characterized by such an oversize in longitudinal direction of the strand (5) substantially consisting of filaments (6) of conducting material, that portions thereof project from the supporting structure.

5. An electric fence wire construction according to any one of the preceding claims, characterized in that the conducting material substantially consists of copper.

6. An electric fence wire construction according to any one of claims 1-4, characterized in that the conducting material substantially consists of aluminum.

7. An electric fence wire construction according to any one of the preceding claims, characterized in that the diameter of the filaments (6) of conducting material is smaller than or equal to 0.25 mm.

8. An electric fence wire construction according to any one of the preceding claims, characterized in that the diameter of the filaments (6) of conducting material is smaller than or equal to 0.16 mm and greater than or equal to 0.10

mm.

9. An electric fence wire construction according to any one of the preceding claims, characterized in that the strand (5) substantially consisting of filaments (6) of conducting material comprises at least four filaments (6).

10. An electric fence wire construction according to any one of the preceding claims, characterized in that the strand (5) substantially consisting of filaments (6) of conducting material comprises at least seven and at most eighteen filaments (6).

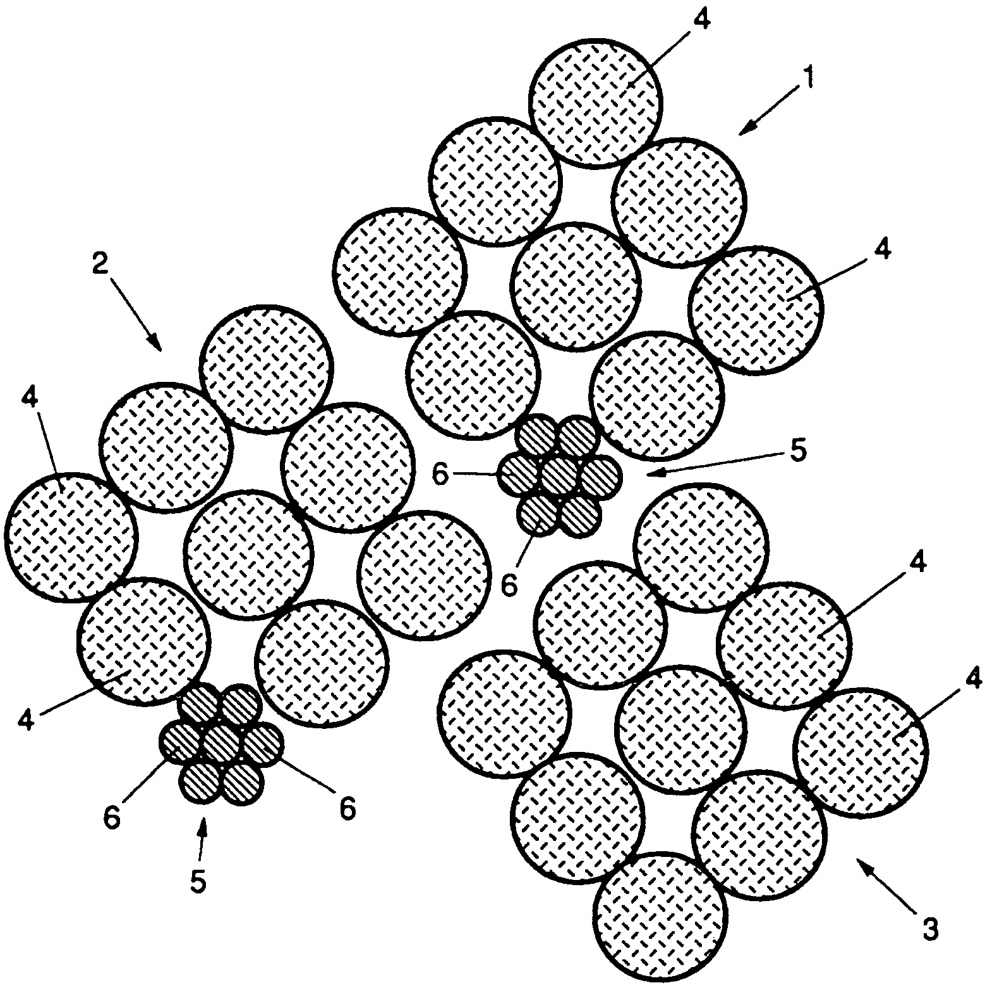

FIG. 1

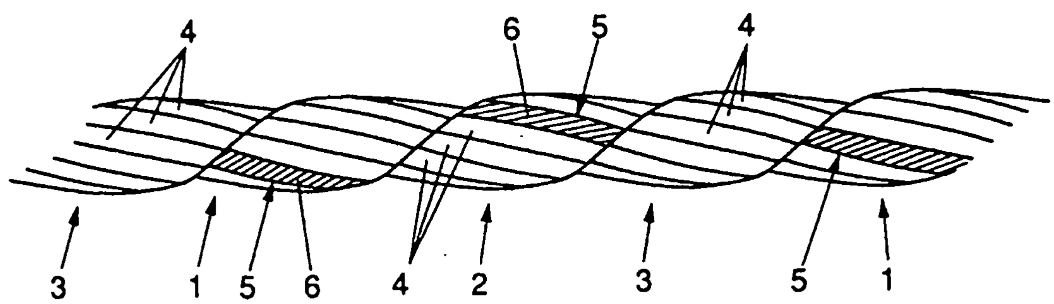

FIG. 2

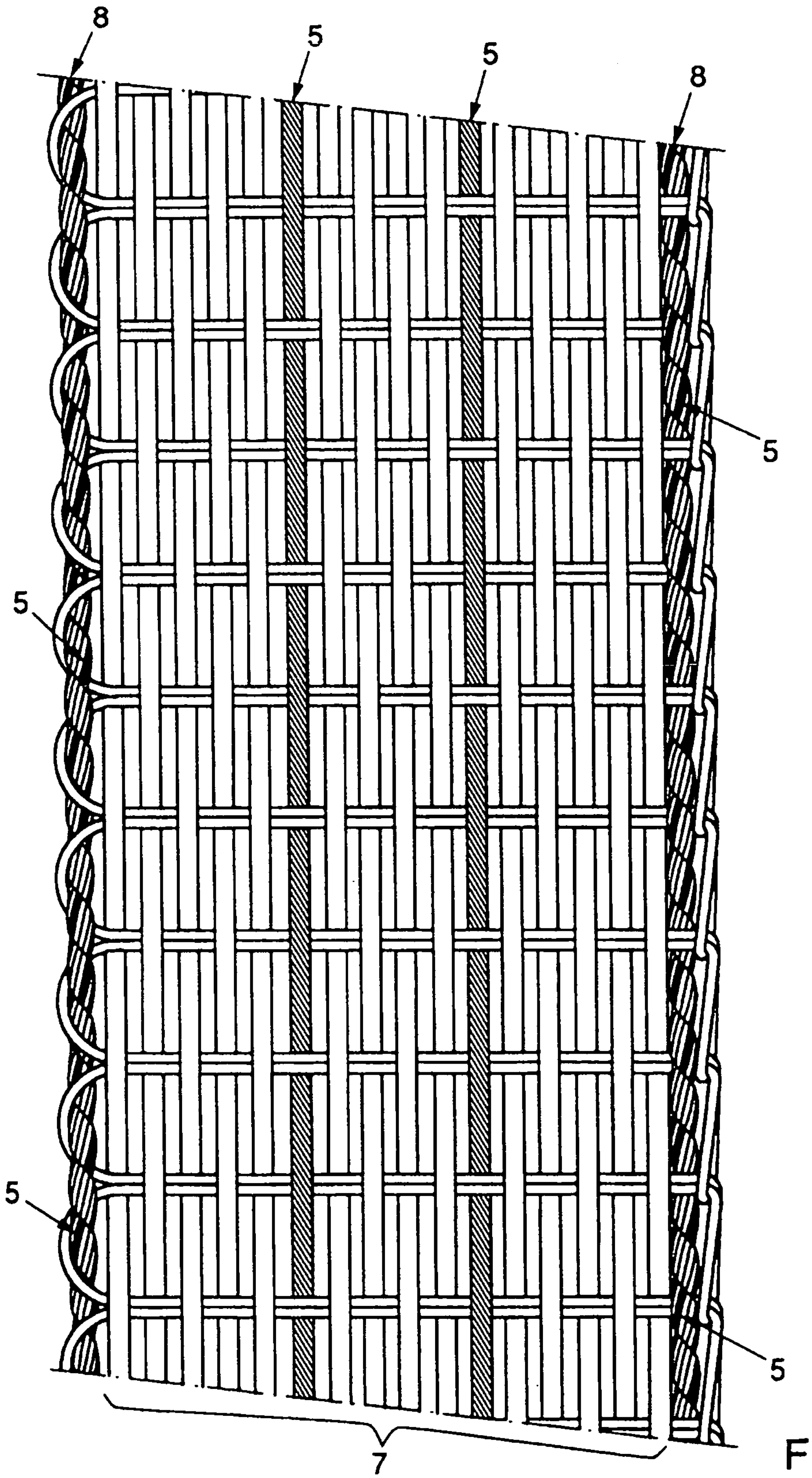

FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 93 20 2865

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X A	NL-A-6 405 950 (BRIDPORT - GUNDRY) * page 2; claims 1,2 * ---	1,2 5,6	H01B5/00
A	FR-A-2 625 599 (FRAPIER) * claims 1-6; figures 3,6 * -----	1-3,5,6	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			H01B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	18 January 1994	DEMOLDER, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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